

REMARKS

Claims 1-3 and 5-9 are all the claims pending in the application. Claims 1-3 have been rejected and claims 5-7 have been withdrawn. Claims 8-9 are added by this Amendment.

RESTRICTION/ELECTION

Applicant acknowledges the Examiner's restriction and election of claims 1-3. Applicant reserves the right to file a divisional application directed to the subject matter of claims 5-7.

35 U.S.C. § 112 REJECTION

The Examiner argues that the amendments to claim 1 incorporate new subject matter as the claim terms "control device to move the bonding tool" and "control device to move the substrate recognition camera" are not sufficiently described in the specification.

As an initial matter, Applicant notes that the Examiner's rejection fails to look at the claims as a whole and paraphrases the claim language. Claim 1 recites

a control device for controlling said up-and-down mechanism and the moving mechanism,

wherein said control device is configured to move said bonding tool so that said chip recognition camera recognizes a lower surface of said chip when the lower surface of said chip is located substantially on a level with a chip bonding surface of said substrate,

wherein said control device is configured to move the substrate recognition camera so that the substrate recognition camera recognizes a position of the substrate mounted on the substrate stage, and

wherein said control device is configured to move said bonding tool to bond said chip onto said substrate based on based on recognition results of said chip recognition camera and said substrate recognition camera.

The Examiner's rejection recites only the underlined portion of claim 1.

Applicant submits that one of ordinary skill in the art having reviewed Applicant's originally filed application, including the figures, the claims and the written description, would appreciate and understand that Applicant's novel bonding apparatus could include a control device as recited in claim 1 as amended in Applicant's October 29, 2004 Amendment Under 37 C.F.R. § 1.114(c).

The exemplary embodiments of the bonding tool and the methods for using the same disclosed in the originally filed application teach a device and a method requiring precise movement of the up-and down mechanism 7, which includes bonding tool 2, and the substrate recognition camera 14. Those of ordinary skill in the art would understand, based on Applicant's disclosure, that such the movements of the various components disclosed are controlled by a control device.

Paragraphs 12 of the originally filed application states:

The bonding tool 2 is made to move up and down freely together with the bonding head 5 by a Z-axis drive motor 6 and an up-and-down mechanism 7.

Though not shown in detail in the drawing, the head up-and-down mechanism 7 is constituted by a ball screw, a guide, and so on, for transmitting the rotation of the Z-axis drive motor 6. The bonding head 5 is supported on a support member 8 so that the bonding head 5 can be moved freely up and down. Incidentally, a substrate recognition camera 14 is installed, while facing downward, on the support member 8.

Again, one of ordinary skill in the art would appreciate that "made to move" when applied to a bonding tool for bonding micro-electronic components would implicate a control device as recited in amended claim 1.

35 U.S.C. § 103 REJECTION

The Examiner rejected claims 1-3 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,193,132 to Shibata *et al.* (“Shibata”) in view of U.S. Patent No. 6,337,489 to Matsumoto *et al.* (“Matsumoto”). Applicants respectfully traverse this rejection as the references fail to establish *prima facie* obviousness for at least the following reasons.

A. The Examiner Has Not Provided Support For His Position.

While Applicant appreciates the Examiner’s position, i.e., that Shibata and Matsumoto must only be *capable* of performing with the range recited in the present claims, the Examiner has not provided any support for his position. Therefore, Applicant respectfully submits that the Examiner has not met his burden of establishing *prima facie* obviousness.

B. The Combination of Shibata and Matsumoto Fails to Render Claims 1-3 Obvious.

1. Claim 1

a. Shibata and Matsumoto Fail to Teach or Suggest All the Elements as Set Forth in Claim 1.

Claim 1 sets forth a bonding apparatus having a chip recognition camera disposed to be lower than a level of a substrate mounting surface of a substrate stage to thereby recognize a chip held by a bonding tool from a position below the chip, wherein a control device has moved the chip so that the chip recognition camera recognizes a lower surface of the chip when the lower surface of the chip is located substantially on a level with a chip bonding surface of the substrate.

In Shibata, the chip picked up by the bonding tool 12 is recognized by the first recognition camera 14, and thereafter the provisional bonding is performed based on the recognition result. Then, the reference mark of the substrate and the chip are detected by the

second recognition camera 16 to seek the positional relationship between the substrate and the chip. This is a teaching operation. *See* column 6, line 10 to 62. Thereafter, the actual bonding is performed, and finally a shift amount of bonding is detected to thereby judge OK or NG of the bonding operation. *See* column 6, line 63 to column 7, line 40.

In contrast to the present invention as set forth in claim 1, in Shibata's apparatus the lower surface of the chip is not located substantially on a level with a chip bonding surface of the substrate. Further, although the chip 13 is recognized by the first recognition camera 14 in Shibata, it must judge OK or NG of the bonding due to bonding shift amount. Such judgment of the bonding inherently indicates that the bonding shift owing to the shift of the bonding axis (ball screw, guide, etc.) is necessarily caused as described in the background section of the present application. Shibata never teaches or discloses specific solutions to solve that problem. In other words, because Shibata gets errors in positioning, it does not inherently recognize the chip when the chip is in substantially the same plane as the bonding surface of the substrate.

Moreover, Matsumoto teaches a chip recognition camera 8 that recognizes a bonding surface of a chip 23. However, there is no teaching or suggestion as to where the chip 23 is located relative to the substrate 22 when recognized by the camera 8.

Further still, neither Matsumoto or Shibata teach or suggest a control device as recited in claim 1.

Accordingly, even assuming that one of ordinary skill in the art were motivated to combine Shibata and Matsumoto as suggested by the Examiner, any such combination would still fail to teach or suggest a chip recognition camera disposed lower than a level of a substrate mounted surface of a substrate stage, wherein a control device is configured to move a bonding

tool so that the chip recognition camera recognizes a lower surface of the chip when the lower surface of the chip is located substantially on a level with a chip bonding surface of the substrate, as set forth in claim 1.

b. The Examiner Has Provided No Credible Motivation To Combine the Teachings of Shibata and Matsumoto.

In addition, the Examiner has not identified a credible motivation to combine Shibata with Matsumoto. There is no motivation to recognize the chip when the lower surface of the chip is located substantially on a level with a chip bonding surface of the substrate, as set forth in claim 1, to eliminate the shift amount. Further, the Matsumoto reference in several instances refers to its disclosure as teaching a bonding apparatus with high precision. Col. 1, line 8; col. 1, line 47; col. 5, line 19. One of ordinary skill in the art would not be motivated to combine Matsumoto with Shibata because Matsumoto purports to teach a device to position a chip on a substrate with high accuracy. Whereas Shibata's invention is directed to detecting errors in position. Thus, modifying Shibata's device so as to be highly accurate runs at cross-purposes to Shibata's error detection invention. In fact, the Examiner's suggested modification of Shibata would destroy that invention.

c. The Examiner May Not Rely On Measurements From Shibata's Figures.

To the extent that the Examiner is relying on measurements from Shibata's figures, such is impermissible because there is no indication that the drawings are to scale. And proportions of features in a drawing are not evidence of actual proportions when drawings are not to scale. When a reference does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on measurement of the drawing features are of little value. MPEP § 2125.

2. Claim 2

With respect to claim 2, a chip recognition camera configured to be focused on a certain position defines a specific structure. Specifically, it is a structural limitation on the focal length/range of the camera. As recited in claim 2, that focal length/range is defined with respect to other structural elements in the claim. Neither Matsumoto or Shibata teach a bonding apparatus having a camera with a structure, i.e., a focal length/range as recited in claim 2.

3. Claim 3

As claim 3 depends on claim 1, Applicant submits that claim 3 is patentable over Shibata and Matsumoto, alone or in combination, at least based on this dependency.

NEW CLAIMS

Claims 8-9 are added by this Amendment. Claim 8 recites a bonding apparatus comprising:

 a bonding tool configured to hold a chip, the bonding tool being movable in a first direction;

 a substrate stage on which a substrate is mounted, the substrate stage being configured to set the substrate relative to said bonding tool in a reference plane;

 a chip recognition camera disposed on an opposite side of said bonding tool with respect to the reference plane to recognize said chip held by said bonding tool; and

 a substrate recognition camera disposed on an opposite side of the substrate stage to recognize the substrate mounted on the substrate stage,

 wherein said chip recognition camera recognizes a lower surface of said chip in a state that the lower surface of said chip is located on the reference plane, and said substrate recognition camera recognizes a position of the substrate on the reference plane, and

wherein said bonding tool and said substrate stage are controlled based on recognition results of said chip recognition camera and said substrate recognition camera.

The introduction of a reference plane makes clear that the lower surface of the chip is located on the reference plane and a substrate recognition camera recognize a position of the substrate on the reference plane, thus, the apparatus of claim 8 can position a chip on the substrate with high precision. Shibata and Matsumoto do not teach or suggest such a bonding apparatus.

CONCLUSION

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



Brandon M. White
Registration No. 52,354

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
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